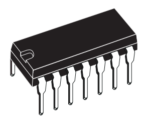
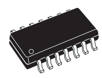
NE556
SA556 - SE556

GENERAL PURPOSE DUAL BIPOLAR TIMERS

- LOW TURN OFF TIME
- MAXIMUM OPERATING FREQUENCY GREATER THAN 500kHz
- TIMING FROM MICROSECONDS TO HOURS
- OPERATES IN BOTH ASTABLE AND MONOSTABLE MODES
- HIGH OUTPUT CURRENT CAN SOURCE OR SINK 200mA
- ADJUSTABLE DUTY CYCLE
- TTL COMPATIBLE
- TEMPERATURE STABILITY OF 0.005% PER°C



N
DIP14
(Plastic Package)



D
SO14
(Plastic Micropackage)

DESCRIPTION

The NE556 dual monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For a stable operation as an oscillator, the free running frequency and the duty cycle are both accurately controlled with two external resistors and one capacitor.

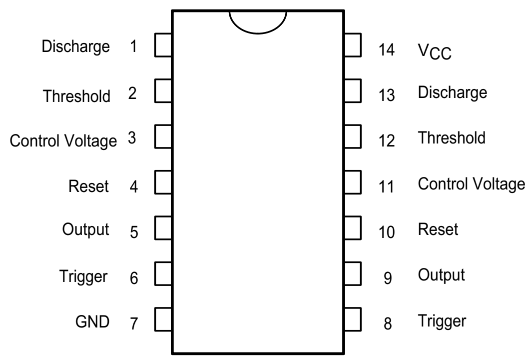
The circuit may be triggered and reset on falling waveforms, and the output structure can source or sink up to 200mA.

ORDER CODE

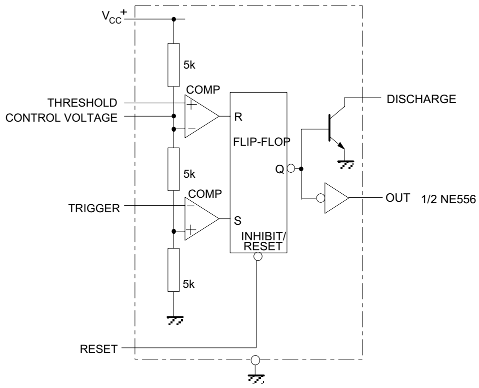
Part Number	Temperature Range	Package	
		N	D
NE556	0°C, 70°C	•	•
SA556	-40°C, 105°C	•	•
SE556	-55°C, 125°C	•	•

N = Dual in Line Package (DIP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)

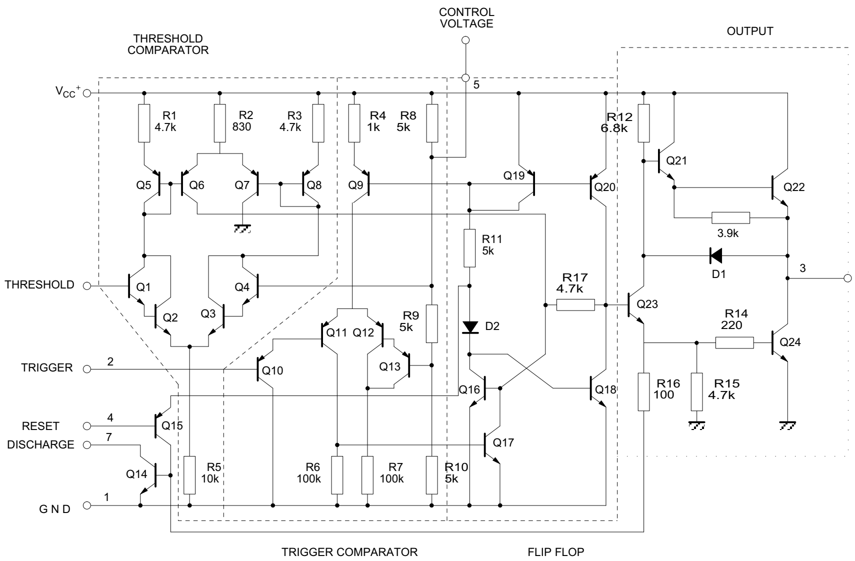
PIN CONNECTIONS (top view)



BLOCK DIAGRAM



SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	18	V
T_j	Junction Temperature	150	°C
T_{stg}	Storage Temperature Range	-65 to 150	°C

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage NE556 SA556 SE556	4.5 to 16 4.5 to 16 4.5 to 18	V
V_{th}, V_{trig}, V_{cl}, V_{reset}	Maximum Input Voltage	V_{CC}	V
T_{oper}	Operating Free Air Temperature Range for NE556 for SA556 for SE556	 0 to 70 -40 to 105 -55 to 125	°C

ELECTRICAL CHARACTERISTICS T_{amb} = +25°C, V_{CC} = +5V to +15V (unless otherwise specified)

Symbol	Parameter	SE556			NE556 - SA556			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
I_{CC}	Supply Current (RL ∝) - note [1] (2 timers) Low Stage V_{CC} = +5V V_{CC} = +15V High State V_{CC} = +5V		6 20 4	10 24		6 20 4	12 30	mA
	Timing Error (monostable) (R_A = 2k to 100kΩ, C = 0.1µF) Initial Accuracy - note [2] Drift with Temperature Drift with Supply Voltage		0.5 30 0.05	2 100 0.2		1 50 0.1	3 0.5	% ppm/°C %/V
	Timing Error (astable) (R_A, R_B = 1kΩ to 100kΩ, C = 0.1µF, V_{CC} = +15V) Initial Accuracy - see note 2 Drift with Temperature Drift with Supply Voltage		1.5 90 0.15			2.25 150 0.3		% ppm/°C %/V
V_{CL}	Control Voltage Level V_{CC} = +15V V_{CC} = +5V	9.6 2.9	10 3.33	10.4 3.8	9 2.6	10 3.33	11 4	V
V_{th}	Threshold Voltage V_{CC} = +15V V_{CC} = +5V	9.4 2.7	10 3.33	10.6 4	8.8 2.4	10 3.33	11.2 4.2	V
I_{th}	Threshold Current - note [3]		0.1	0.25		0.1	0.25	µA
V_{trig}	Trigger Voltage V_{CC} = +15V V_{CC} = +5V	4.8 1.45	5 1.67	5.2 1.9	4.5 1.1	5 1.67	5.6 2.2	V
I_{trig}	Trigger Current (V_{trig} = 0V)		0.5	0.9		0.5	2.0	µA
V_{reset}	Reset Voltage [4]	0.4	0.7	1	0.4	0.7	1	V
I_{reset}	Reset Current V_{reset} = +0.4V V_{reset} = 0V		0.1 0.4	0.4 1		0.1 0.4	0.4 1.5	mA
V_{OL}	Low Level Output Voltage V_{CC} = +15V $I_{O(sink)}$ = 10mA $I_{O(sink)}$ = 50mA $I_{O(sink)}$ = 100mA $I_{O(sink)}$ = 200mA V_{CC} = +5V $I_{O(sink)}$ = 8mA $I_{O(sink)}$ = 5mA		0.1 0.4 2 2.5 0.1 0.05	0.15 0.5 2.2 0.25 0.2		0.1 0.4 2 2.5 0.3 0.25	0.25 0.75 2.5 0.4 0.35	V
V_{OH}	High Level Output Voltage V_{CC} = +15V $I_{O(sink)}$ = 200mA $I_{O(sink)}$ = 100mA V_{CC} = +5V $I_{O(sink)}$ = 100mA	 13 3	12.5 13.3 3.3		 12.75 2.75	12.5 13.3 3.3		V
$I_{dis(off)}$	Discharge Pin Leakage Current (output high) (V_{dis} = 10V)		20	100		20	100	nA
$V_{dis(sat)}$	Discharge pin Saturation Voltage (output low) - note [5] V_{CC} = +15V, I_{dis} = 15mA V_{CC} = +5V, I_{dis} = 4.5mA		180 80	480 200		180 80	480 200	mV
t_r t_f	Output rise Time Output Fall Time		100 100	200 200		100 100	300 300	ns
toff	Turn off Time - note [6] (V_{reset} = V_{CC})		0.5			0.5		µs

1. Supply current when output is high is typically 1mA less.
2. Tested at V_{CC} = +5V and V_{CC} = +15V
3. This will determine the maximum value of R_A + R_B for +15V operation the max total is R = 20MΩ and for 5V operation the max total R = 3.5MΩ
4. Specified with trigger input high
5. No protection against excessive pin 7 current is necessary, providing the package dissipation rating will not be exceeded
6. Time measured from a positive going input pulse from 0 to 0.8x Vcc into the threshold to the drop from high to low of the output trigger is tied to threshold.

Figure 1 : Minimum Pulse Width Required for Triggering

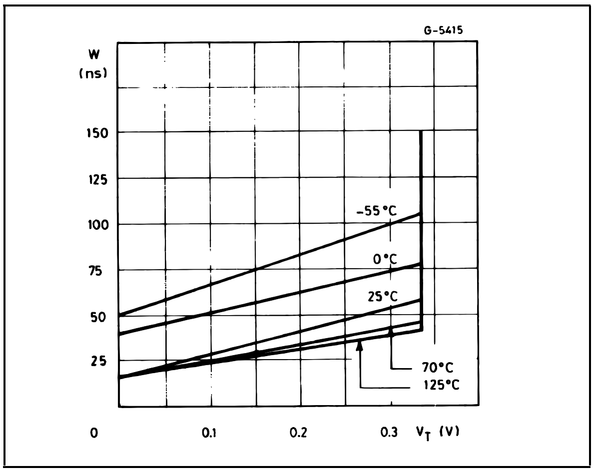


Figure 4 : Low Output Voltage versus Output Sink Current

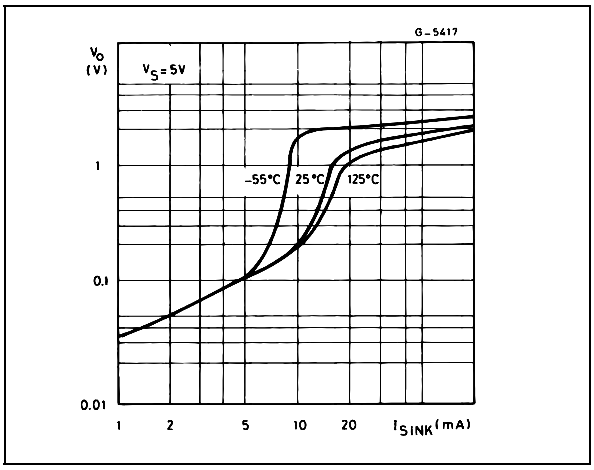


Figure 2 : Supply Current versus Supply Voltage

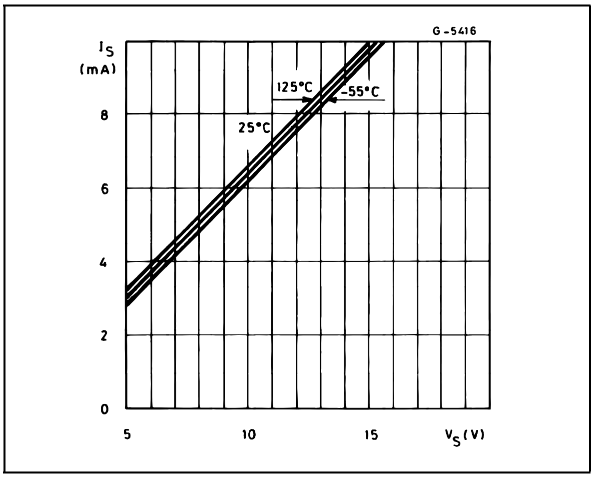


Figure 5 : Low Output Voltage versus Output Sink Current

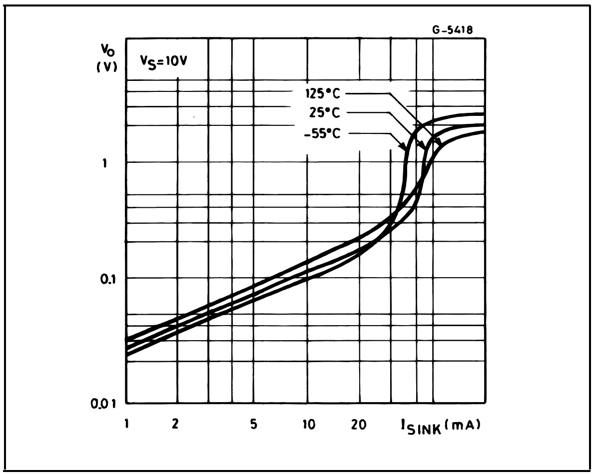


Figure 3 : Delay Time versus Temperature

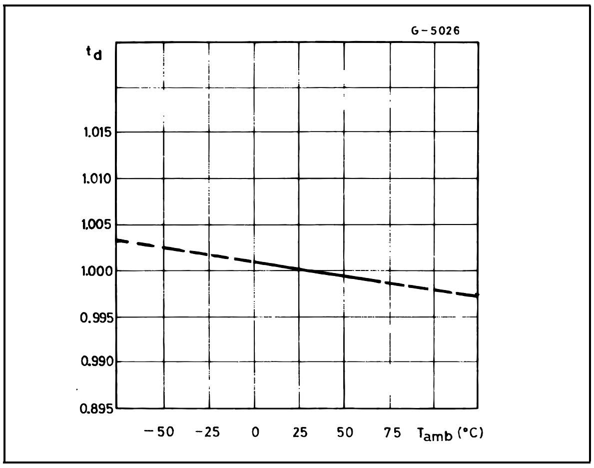


Figure 6 : Low Output Voltage versus Output Sink Current

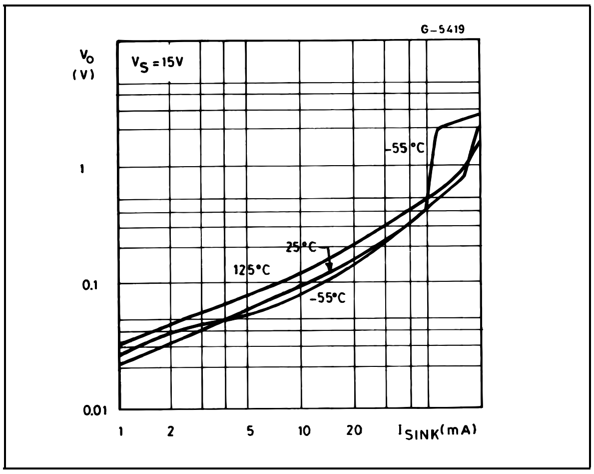


Figure 7 : High Output Voltage Drop versus Output

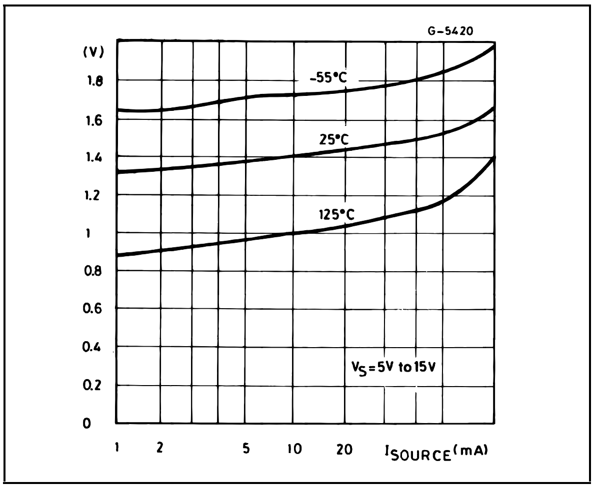


Figure 8 : Delay Time versus Supply Voltage

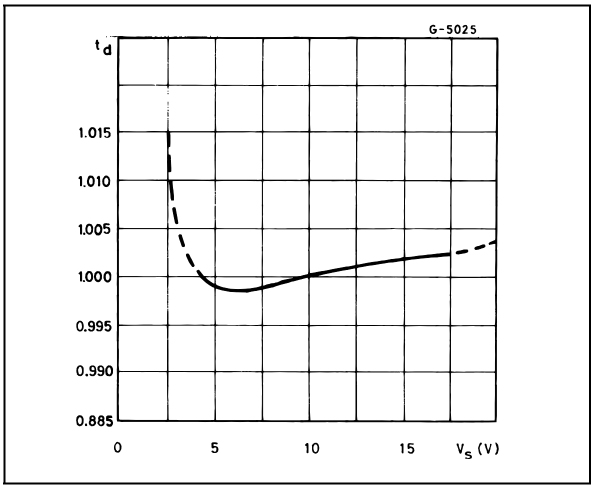
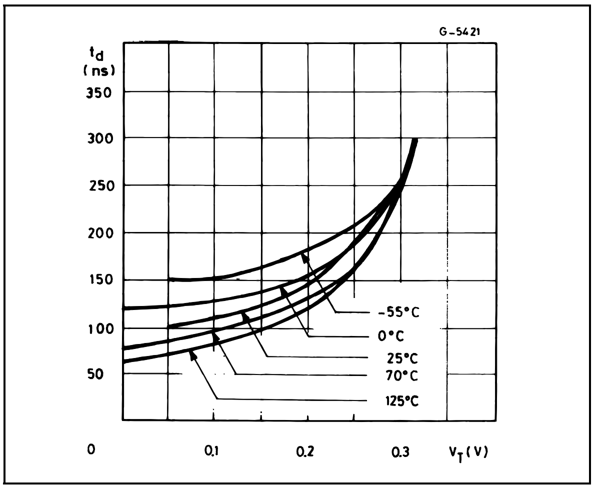
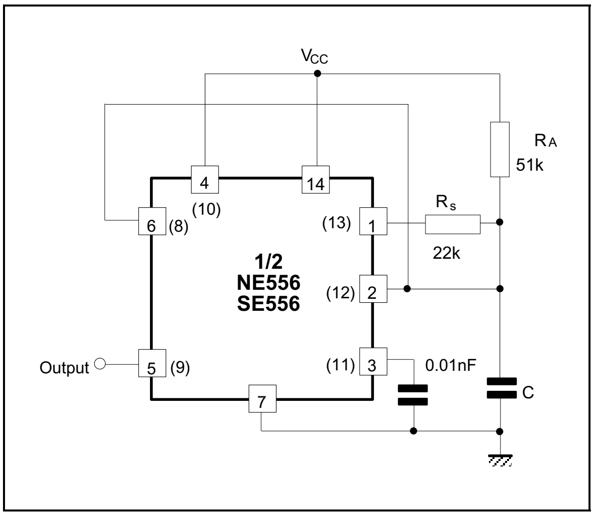


Figure 9 : Propagation Delay versus Voltage Level of Trigger Value



TYPICAL APPLICATION

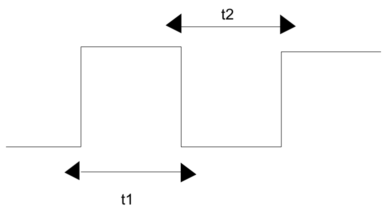
50% DUTY CYCLE OSCILLATOR



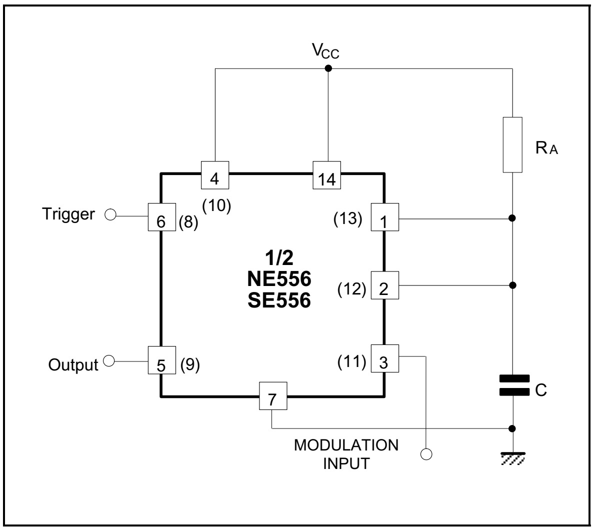
$t_1 = 0.693\ R_A.C$

$t2 = [(RARB)/(RA+RB)]CLn \left[\frac{RB - 2RA}{2RB - RA}\right]$

$f = \frac{t1}{t1 + t2}\ RB < \frac{1}{2}\ RA\ ti$

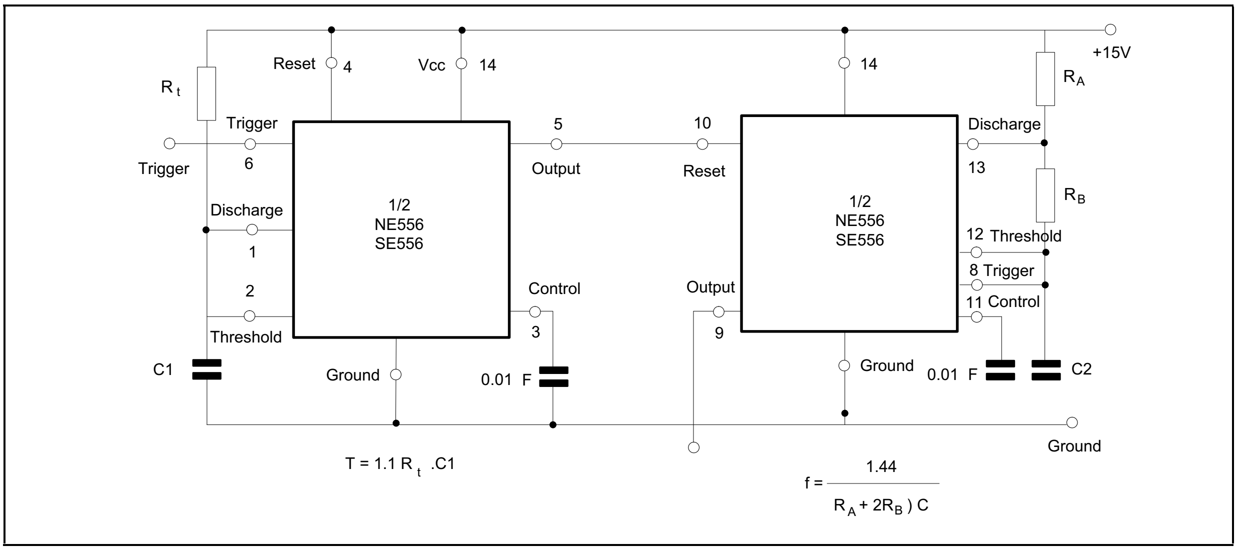


PULSE WIDTH MODULATOR

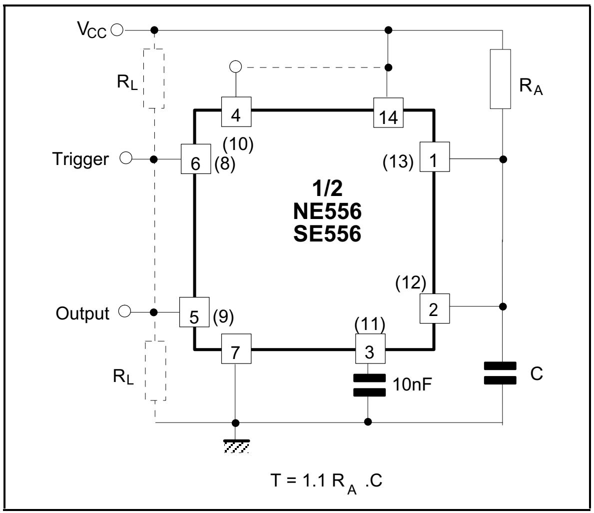


TONE BURST GENERATOR

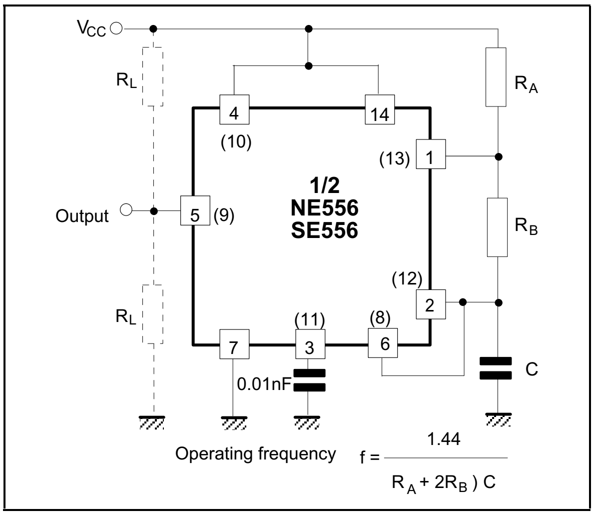
For a tone burst generator the first timer is used as a monostable and determines the tone duration when triggered by a positive pulse at pin 6. The second timer is enabled by the high output or the monostable. It is connected as an astable and determines the frequency of the tone.



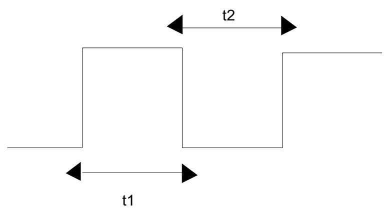
MONOSTABLE OPERATION



ASTABLE OPERATION



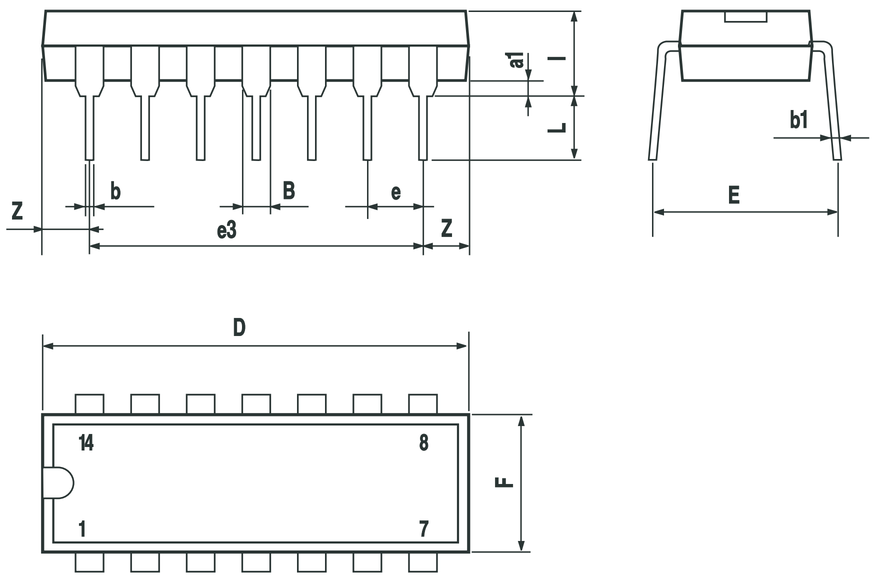
$t_1 = 0.693\ (R_A + R_B)\ C$ Output High
$t_2 = 0.693\ R_B C$ Output Low



PACKAGE MECHANICAL DATA

Plastic DIP-14 MECHANICAL DATA

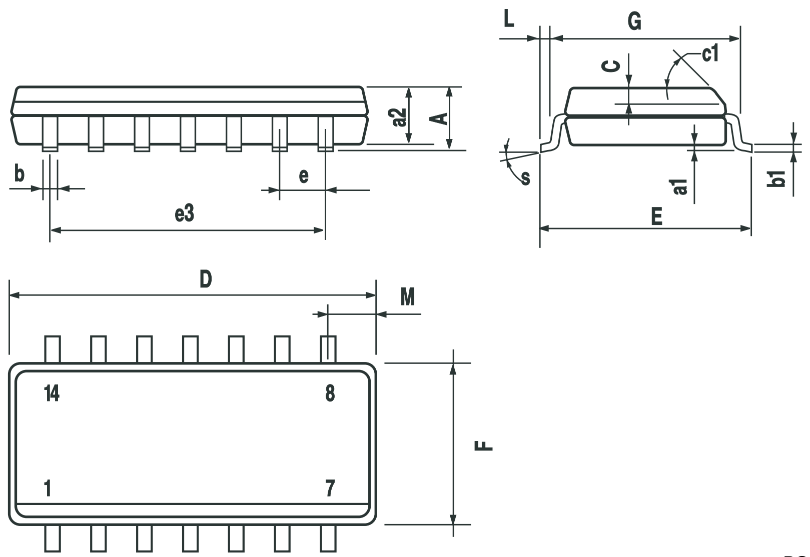
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

PACKAGE MECHANICAL DATA

SO-14 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



PO13G